

## Development of a New Multi-Nutrient Fertilizer Standard Reference Material

*In the past, the fertilizer industry was responsible for validating only the nutrient content of their products until an imported material used to manufacture fertilizers was contaminated with cadmium (Cd) at the percent level. This discovery resulted in many states enacting new regulations limiting the amounts of contaminant metals in fertilizers. In response, the fertilizer industry requested that NIST develop reference materials to support the development and validation of new analytical methods that will be required to demonstrate compliance with the new and proposed regulations.*

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The fertilizer industry and its regulators need a well-characterized multi-nutrient blended fertilizer reference material for use in method development and validation. A candidate material was obtained from the industry to determine the best method for preparing a homogenous material, and to develop an appropriate analytical approach.

A US fertilizer company then provided 187 kg of coarse-ground, blended fertilizer comprised of ammonium phosphate, different forms of urea, potassium nitrate, potash, borax, and various metal oxy-sulfates. Preliminary analyses of sieved portions indicated that the material should be further ground to improve homogeneity. The material was jet-milled, blended, and bottled to create SRM 695 Trace Elements in Multi-Nutrient Fertilizer. Subsamples of this bottled material were subjected to x-ray fluorescence spectrometry (XRF) and prompt gamma-ray activation analysis (PGAA) to determine material homogeneity. Material homogeneity was acceptable. Additional analyses using XRF, instrumental neutron activation analysis (INAA), PGAA, and inductively coupled plasma optical emission spectrometry (ICP-OES), isotope dilution inductively coupled plasma mass spectrometry (ID-ICP-MS), and cold vapor ICP-MS were performed to determine element content. Results were combined to provide certified or reference values for the elements of interest.

Certified or reference values were provided for all regulated elements including As, Cd, Co, Cr, Hg, Mo, Ni, Pb, Se, and Zn; nutrient elements B, Ca, Cl, Cu, Fe, K, Mg, Mn, N, and P; and four additional non-nutrient elements, Al, Na, Ti, and V.

The new SRM 695 Trace Elements in Multi-Nutrient Fertilizer will allow the fertilizer industry and state and local laboratories to develop and validate methods and verify critical analyses needed for regulatory compliance.



**Impact:** About a dozen US states now have fertilizer regulations in place and several other states have proposed regulations that are pending approval. In addition, other countries have proposed limits on metals for these materials and these new regulations will impact global trade. Use of this new SRM will enable compliance with national and international regulations for metal content of fertilizer materials.

**Future Plans:** NIST will continue to work with fertilizer producers and state regulatory agencies to assess the impact of this SRM and needs for additional reference materials.